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REVIEWS AND BOOK NOTICES.

The Fossil Plants of Canada.* —This elaborate work relates chiefly to the Devonian flora of Gaspé and St. John, New Brunswick, and indeed is a revision of the Pre-carboniferous flora of Eastern North America, as the author has introduced "such allied species from New York, Ohio, and Maine as may serve to illustrate the Canadian species." He proposes the term Erian, derived from the great Erie division of the New York geologists, instead of Devonian, hoping "to keep before the minds of geologists the caution that they should not measure the Erian formations of America or the fossils which they contain, by the comparatively depauperated representatives of this portion of the geological scale in the Devonian of Western Europe."

The notices and figures illustrating the Dadoxylon, "evidently an Araucarian conifer" of which no foliage nor fruit have been found, only drifted trunks a foot in diameter; of the Psilophyton, the species of which were "synthetic or generalized plants," having rootlets resembling those of some ferns, stems having the structure of Lycopodium, and rudimentary leaves also resembling those of the club mosses (Lycopodiaceæ), branchlets with circinati venation like that of ferns, and sporangia of a type quite peculiar to themselves, are of much interest. He also describes and figures the trunks of tree ferns from Gilboa, N. Y. "where these trunks are stated to occur in an erect position in sandstone" and are now in Prof. Hall's collection, while Prof. Newberry has communicated to him "two well characterized trunks of tree ferns from the Devonian of Ohio, and another from Gilboa, N. Y. so that the occurrence of large tree ferns in the Erian flora is now well established."

As to Silurian vegetation, a few sea weeds occur in the Upper Silurian limestones of Gaspé, but with them are associated in the lower part of the limestone, remains of the land plant Psilophyton, which suffice to indicate the existence of neighboring land, probably composed of the Lower Silurian rocks, and supporting vegetation. He also announces on a subsequent page his discovery of fossil trees of the type of Prototaxites in the Upper Silurian of England.

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*The fossil plants of the Devonian and Upper Silurian formations of Canada. By J. W. Dawson, LL. D, F.R.S, F.G.S. With twenty plates and cuts. Geological Survey of Canada, Montreal. Dawson Brothers, 1871. Royal 8vo. pp. 923. $2.50.

Comparing the Devonian flora with that of the Carboniferous period, so familiar to most of our readers, who have seen the beautiful impression of fern leaves from the shales enclosing veins of coal, our author states that *generically* the two floras are in the main identical. "The most important and characteristic Carboniferous genera are also among those best represented in the older flora. On the other hand, while some Carboniferous genera have not yet been recognized in the Devonian, the latter possesses some peculiar generic forms of its own, and these are especially abundant in the lower part of the system. As examples of such genera I may name Psilophyton, Prototaxites, Leptophleum and Arthrostigma. Further, it may be remarked that these peculiar Erian plants present highly composite or synthetic types of structure, giving to these a more archaic air than that of the Carboniferous flora." "Specifically, however, the Devonian flora is almost altogether distinct from the Carboniferous. Even the same genera are represented by distinct species, and it is possible that some of the few species which we now identify with those of the Coal, will in future be found to be distinct." He remarks that "while the distribution of genera in the Devonian leads us to infer climatal conditions in the main resembling those of the Carboniferous, it would also lead us to conclude that the local diversities were greater, and that there was less of that dead level of similar local conditions which prevailed so extensively in the Carboniferous period. The Devonian plants probably grew on limited rocky islands, bordered by much less extensive and permanent lowlands than those of the Carboniferous era."

Although we have quoted enough to convince our readers that we are indebted to Dr. Dawson for one of the most valuable and entertaining monographs that has enriched our science during the year, we have yet to glean still more interesting results of his patient and extended researches in fossil botany. Questions regarding the origin of the flora as a whole, as well as of the single species, and the death of both isolated species and entire floras, inevitably arise and must be met by the student in science. They are discussed by our author in his usual candid and philosophical spirit. He refers—

"For a moment to views of the sequence of Palæozoic plants which might be entertained in accordance with theories of derivation of species now prevalent. The lower Devonian is distinguished by the abundance of some remarkable forms referred to algæ of the genera Spirophyton and Dictyophyton of Hall, also for the occurrence of vast quantities of humbly organized acrogens suited for a semi-aquatic habitat, as Psilophyton and Annularia. May not these two groups of plants be related in the way of derivation? Again the synthetic types of acrogens of the lower Devonian, and the prototypal exogens of the genus Prototaxites give way in the middle Devonian to more perfect and specialized types of acrogens and gymnosperms; may they not have been advanced by a process of evolution? Such speculations have charms for persons of vivid imagination, and may be supported by the analogy between the progress of the development of the individual plant and the succession of plants in geological time; but the present case affords to them a support more apparent than real. The gap between the algæ and acrogens like Psilophyton with a well developed scalariform axis is very great. The algæ in question did not precede Psilophyton but were contemporaneous with it, and their association may be explained by the co-existence of submerged shallows favorable to algæ, and swampy flats favorable to Psilophyton and its allies, and by the alternation of these conditions in the same locality. Prototaxites does not change into Dadoxylon. It disappears and is replaced by a type of wood which continues to the present day. Psilophyton continues to exist without improvement along with the Lepidodendra and ferns of the Middle and Upper Devonian, and merely becomes less abundant until it finally disappears. The phenomena are rather those of the gradual extinction of the old flora and the introduction of a new one from some different source. If therefore we desire to account for the succession of floras in this way, we must suppose local extinction and the introduction from another region of plants which in the meantime have been modified there."

In considering the relations of the Pre-carboniferous to the older floras, he considers that in accordance with the views that have been so well illustrated by Prof. Hall as to the derivation of the sediments forming the American Silurian strata from the northeast, and the gradual extension in each succeeding period of land and shallow water to the southwest we should expect to find the oldest land plants towards the northeast. "Accordingly, it is in Gaspé that as yet we have the only link of connection of the Erian flora with that of the Silurian period," *i. e.*, the remains of a club moss (Psilophyton); and he believes that a by no means sparse land vegetation accompanied it. But he boldly inquires whether land plants did not exist in the Lower Silurian, and even hints that we might look for the actual origin of land vegetation in the

Laurentian period. He thinks it "possible that the rocks of Newfoundland or Labrador, or beds now buried under the Atlantic, may be those which alone contain the remains of the lower Silurian plants." The Eophyton of Torell from the primordial or Lower Silurian rocks of Sweden, "if a land plant at all" (for Dawson regards "it as a doubtful plant, similar forms being apparently produced by impressions of feet or fins on the surface of mud"), the author regards as more nearly allied to Psilophyton than to any other genus, saying that "whatever the nature of these forms, they are present in the primordial of America as well. Mr. Murray has found them in Newfoundland and Mr. Selwyn in Nova Scotia, in rocks probably of this age."

> "Such views as to a primitive Silurian and Laurentian flora are strengthened by the obvious fact that the plants of the lower and middle Devonian have the aspect of the remains of a decaying flora verging on extinction, and pointing backward in geological time, while those of the upper Devonian give us a great number of new forms and point onward to the Carboniferous. As already stated, the lower and middle Erian flora stands by itself in the prevalence of such archaic, and prototypal forms as Prototaxites, Psilophyton, Nematoxylon and Arthrostigma. Is it probable that it was thus isolated? Is it not more likely that these plants were the successors of an older and more primitive flora?
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> This is vividly presented to the mind in the Erian conifers. In the lower sandstones of Gaspé we find numerous trunks of large trees, all having the structure of Prototaxites. In the Hamilton Group of New York and in the sandstones of St. John, these are replaced by Dadoxylon, a type extending into the Carboniferous and thence to the modern Araucarian pines. There is no transition from one type to the other, nor are they intermixed in the same beds. The Middle Devonian would thus seem to have been the grave of Prototaxites, and the birth-place of Dadoxylon, in so far as the regions in question are concerned.
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> Something of the same kind occurs in the Carboniferous, in the scanty and somewhat antique Lower Carboniferous flora pointing backward to the Upper Devonian, just as the Lower Devonian may be supposed to point backward to the Silurian. The above reasons lead me to anticipate with confidence the discovery in the Silurian of a flora similar in type to that of the Lower Devonian, but probably richer in species.
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> Is it possible to indicate where such earlier flora may be expected? In Eastern America, from the Carboniferous period onward, the centre of plant distribution has been the Appalachian chain. From this the plants and sediments extended westward in times of elevation, and to this they receded in times of depression

But this centre was non-existent before the Devonian period, and the centre for this must have been to the north-east whence the great mass of older Appalachian sediment was derived. In the Carboniferous period there was also an eastward distribution from the Appalachian, and links of connection in the Atlantic bed between the floras of Europe and America. In the Devonian such connection can have been only far to the northeast. It is therefore in Newfoundland, Labrador and Greenland that we are to look for the oldest American flora, and in like manner on the border of the old Scandinavian nucleus for that of Europe. Again, it must have been the wide extension of the sea of the Corniferous limestone that gave the last blow to the remaining flora of the Lower Devonian; and the re-elevation in the middle of that epoch brought in the Appalachian ridges as a new centre, and established a connection with Europe which introduced the Upper Devonian and Carboniferous floras. Lastly, from the comparative richness of the later Erian flora in Eastern America, especially in the St. John beds, it might be a fair inference that the northeastern end of the Appalachian ridge was the original birth-place or centre of creation of what we may call the later Palæozoic flora, or of a large part of that flora."

Finally, in a supplementary section Dr. Dawson gives us his theoretical views as to the origin and extinction of species. "Some of the forms reckoned as specific in the Devonian and Carboniferous may be really derivative races." These may have originated in one or more of the following ways;—(1) By a natural tendency in synthetic types to become specialized in the direction of one or other of their constituted elements. (2) "By embryonic retardation or acceleration in the manner illustrated by Hyatt and Cope." (3) "The contracting and breaking up of floras." (4) "The elevation of a great expanse of new land at the close of the Middle Erian and the beginning of the Coal period, would by permitting the extension of species over wide areas and fertile soils, and by removing the pressure previously existing, be eminently favorable to the production of new, and especially of improved varieties."

ANTHROPOLOGICAL INSTITUTE OF NEW YORK.*—In a former number we called attention to the organization of this society, of which we have now received the first fruits in the form of a very interesting and important number of its Journal. The publications

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[*] Journal of the Anthropological Institute of New York. Vol. i, No. 1. 8vo pamph. pp. 100. New York. 1871-72. [50 cts.]